



Picture courtesy of the Missouri Department of Conservation

## **2018 MISSOURI FISH ADVISORY A Guide to Eating Missouri Fish**

Visit the DHSS Fish Advisory website for additional information, educational materials, and kid activities.

[www.health.mo.gov/fishadvisory](http://www.health.mo.gov/fishadvisory)



## WHAT'S NEW IN THE 2018 FISH ADVISORY



This year the Missouri Department of Health and Senior Services (DHSS) has added the three buffalo species (i.e. bigmouth buffalo, black buffalo, and smallmouth buffalo) to the advisory for the Missouri and Mississippi Rivers due to elevated levels of mercury (Hg) and polychlorinated biphenyls (PCBs). The advisory for all catfish >24" in Montrose Lake, Henry County has been reduced to include only flathead catfish as elevated levels of PCBs were not detected in channel catfish. DHSS maintains all other advisories from last year including the statewide mercury advisory for sensitive populations.

### THE GUIDE

This guide informs individuals of the benefits of eating fish and specifies which fish to eat in limited quantities or to not eat due to environmental contaminants. Fish is a good source of high-quality protein, "heart healthy" fatty acids, and essential nutrients that contribute to a healthy diet if eaten regularly. Fish is also low in cholesterol and saturated fats. Many Missouri fish species have omega-3 fatty acids that are essential in the development of the central nervous system and may be beneficial in reducing heart disease.

Annually, the DHSS evaluates contaminant levels in fish to make sure they are safe to eat. All fish contain some, usually small, amounts of chemical contaminants. In most instances and for most people, the health benefits of eating fish outweigh the potential risks from contaminants. However, there are occasions when limited or no consumption of certain fish is appropriate.

To evaluate potential health risks from fish contaminants, DHSS works with the Missouri Department of Conservation (MDC), the Missouri Department of Natural Resources (DNR), and other government agencies. DHSS bases the advisory on extensive, annual fish-tissue studies by MDC and DNR at various Missouri lakes, ponds, rivers, and streams. DHSS uses the most recent science to develop reasonable, conservative consumption guidelines for Missouri.

This guide is not intended to discourage you from eating fish; rather, it should help you make informed decisions about eating fish from Missouri's numerous water bodies. The DHSS recommends that all consumers be aware of the positive benefits of eating fish and the potential adverse health effects of contaminants that may be found in fish.

Fish is a good source of high-quality protein, "heart healthy" fatty acids, and essential nutrients that contribute to a healthy diet.

# Map of Missouri 2018 Fish Advisories

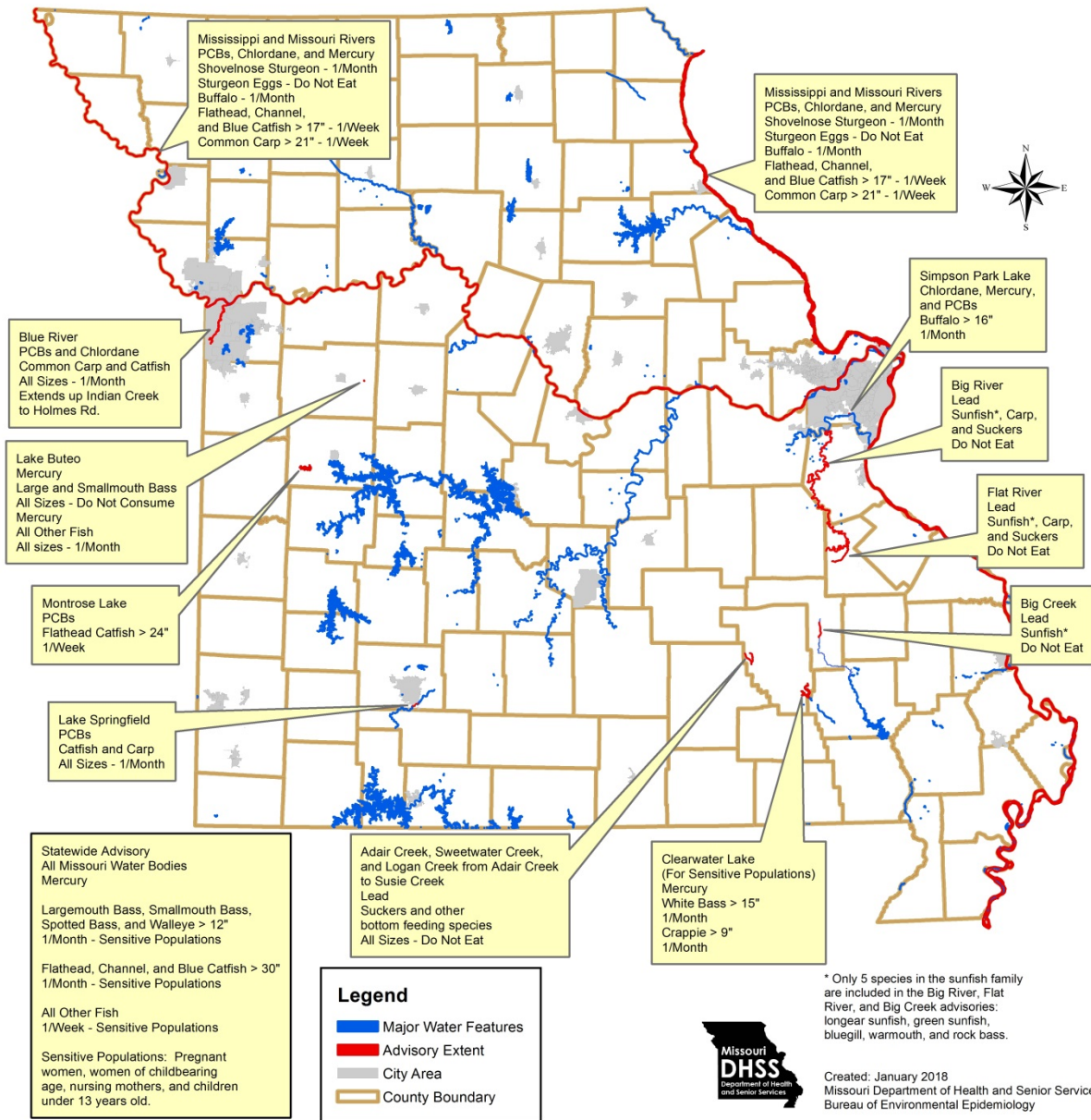


Table of Missouri 2018 Fish Advisories					
Advisory Population	Location	Species <sup>1</sup>	Length (>) greater than	Serving Advice no more than	Contaminant
All Consumers	Mississippi & Missouri Rivers	Shovelnose Sturgeon (excluding eggs)	All sizes	1/month	PCBs, Chlordane, Mercury
		Sturgeon eggs		Do not eat	
		Flathead, Channel, Blue Catfish	> 17"	1/week	
		Buffalo <sup>2</sup>	All sizes	1/month	
		Common Carp	> 21"	1/week	
	Blue River from Minor Park to the Missouri River in Jackson County including Indian Creek up to Holmes Rd.	Common Carp and Catfish	All sizes	1/month	PCBs, Chlordane
	Simpson Park Lake at Simpson Park in St. Louis County	Buffalo <sup>2</sup>	>16"	1/month	Chlordane, Mercury, PCBs
	Big River in St. Francois and Jefferson Counties	Sunfish <sup>3</sup> , Carp, Redhorse Suckers, and other types of suckers	All sizes	Do not eat	Lead
	Flat River in St. Francois County from Highway "B," six miles downstream to where it enters the Big River	Sunfish <sup>3</sup> , Carp, Redhorse Suckers, and other types of suckers	All sizes	Do not eat	Lead
	Big Creek near the town of Glover in Iron County	Sunfish <sup>3</sup>	All sizes	Do not eat	Lead
	Adair Creek, Sweetwater Creek, and Logan Creek from Adair Creek to Susie Creek in Reynolds County	Suckers and other bottom feeding species	All sizes	Do not eat	Lead
	Lake Buteo at Knob Noster State Park in Johnson County	Largemouth and Smallmouth Bass	All sizes	Do not eat	Mercury
		All other fish	All sizes	1/month	
	Montrose Lake in Henry County	Flathead Catfish	>24"	1/week	PCBs
	Lake Springfield in Greene County	Catfish and Carp	All Sizes	1/month	PCBs

1 - To help identify fish species, see the Missouri Department of Conservation's website at: <https://huntfish.mdc.mo.gov/fishing/regulations>.

2 – Several species are described as Buffalo including the smallmouth buffalo, bigmouth buffalo, and black buffalo.

3 - Only five sunfish species are included in the Big River, Flat River, and Big Creek advisories: longear sunfish, green sunfish, bluegill, warmouth, and rock bass.



## Table of Missouri 2018 Fish Advisories

Advisory Population	Location	Species <sup>1</sup>	Length (>) greater than	Serving Advice no more than	Contaminant
<b>Sensitive Populations:</b> Pregnant women, women of childbearing age, nursing mothers, and children younger than age 13.	All United States water bodies	All fish	All sizes	1/week	Mercury
	All Missouri water bodies	Largemouth Bass, Spotted Bass, Smallmouth Bass, and Walleye	> 12"	1/month	Mercury
		Flathead, Channel, Blue Catfish	> 30"		
	Clearwater Lake in Reynolds County	White Bass	> 15"	1/month	Mercury

1 - To help identify fish species, see the Missouri Department of Conservation's website at: <https://huntfish.mdc.mo.gov/fishing/regulations>.

### WHICH MISSOURI FISH TEND TO HAVE LOW CONTAMINANT LEVELS?

Fish in Missouri that typically have very low mercury, PCB, and chlordane levels are trout, crappie (except those from Clearwater Lake), sunfish (except green sunfish and black bass), and suckers. In addition, smaller or younger fish tend to have lower contaminant concentrations than older fish of the same species because younger fish consume smaller prey and have not lived as long to accumulate as many contaminants.



### ADDITIONAL RECOMMENDATIONS

DHSS encourages using fishing weights and lures made of non-lead materials. DHSS also discourages canning, pickling, and grinding certain fish from certain areas. Details on these recommendations can be found in Appendixes D and E.



## HEALTH BENEFITS OF EATING FISH

Recent medical research indicates that both the young and old can have significant health benefits from eating fish. A well-balanced diet that includes a variety of fish and shellfish can contribute to heart health and children's proper growth and development. The American Heart Association recommends that individuals include fish in their diets due to evidence linking fish consumption and a lowered risk of death from coronary heart disease.

Fish is an important part of a healthy diet.

- Fish contain high-quality protein and other nutrients our bodies require.
- Fish is low in saturated fat and cholesterol.
- Fatty fish, such as salmon, herring and, to a lesser extent, tuna and trout, have high levels of omega-3 fatty acids which may:
  - ✓ lower cholesterol when substituted for saturated fatty acids such as those in meat;
  - ✓ improve learning ability in children;
  - ✓ decrease triglycerides;
  - ✓ lower blood pressure;
  - ✓ reduce blood clotting; and,
  - ✓ enhance immune function.

Healthy fish recipes can be found at: [www.heart.org/HEARTORG](http://www.heart.org/HEARTORG), select Healthy Living, Eat Smart, View Recipes.

The American Heart  
Association recommends  
that individuals include fish  
in their diets.

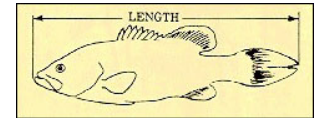
## HOW DO THE RECOMMENDATIONS MADE IN THE 2018 FISH ADVISORY COMPARE TO THOSE MADE BY THE AMERICAN HEART ASSOCIATION AND OTHERS?

The American Heart Association recommends “eating fish, particularly fatty fish, at least two times (two servings) a week.” That recommendation may seem different than the one fish meal per week recommendation in this advisory. However, the two recommendations are comparable. For instance, eating at least two, 3.5-ounce servings of baked or grilled fish each week is roughly equivalent to eating one, 8-ounce fish meal per week.

## TERMS AND DEFINITIONS

**SENSITIVE POPULATIONS:** Because growth and development occur rapidly in young children, some chemicals may affect them differently than adults. Due to the potential risk mercury poses to the developing nervous system of fetuses and young children, special consideration is given to pregnant women, women of childbearing age, nursing mothers, and children younger than 13. These groups will be referred to as sensitive populations throughout this advisory.

**FISH LENGTH:** Fish are measured from the snout to the tip of the tail, as shown in the drawing.



**MEAL SIZE:** This advisory defines a meal as 8 ounces of uncooked fish for a 150-pound person and 3 ounces for a 40-pound child.

**FISH PREPARATION:** The chemical levels in some fish can be reduced by filleting the fish and carefully trimming away the fat when the fish is cleaned (*See trimming and cooking guide in Appendix A*). Some chemicals, like lead, concentrate in bones, while other chemicals, such as chlordane and PCBs, concentrate in fatty tissue. When fish is prepared by filleting and trimming away the fat, contaminants are minimized. **The meal advice in this advisory is based on these preparation techniques. Individuals may be exposed to higher chemical levels if they fail to follow these techniques.** Filleting will not reduce the levels of some chemicals, such as mercury.

As a rule-of-thumb:  
Eat the smaller, legal-size fish  
and release the lunkers so they  
can fight another day.

## GENERAL INFORMATION

### General Rules to Follow

Keep eating fish. Smaller or younger fish tend to have lower levels of contaminants than older fish of the same species because younger fish consume smaller prey and have not lived as long to accumulate as many contaminants. Eat the smaller, legal-size fish and release the lunkers so they can fight another day. Fish in Missouri that typically have very low levels of mercury are trout, crappie (except those from Clearwater Lake), sunfish (except green sunfish and black bass), and suckers.

### Posted Signs

If a fishing location has warning signs posted, follow them. This advisory does not include local warnings. **Specific warnings are special cases and should be followed.**



## FISH CONSUMPTION ADVISORY CATEGORIES

Missouri has three types of fish consumption advisories:



### Unrestricted consumption



### Limited consumption

- Consume no more than **one (1) meal a week** (52 meals a year)
- Consume no more than **one (1) meal a month** (12 meals a year)
- **No consumption** of fish (Do not eat)

## FISH ADVISORY 2018

Individuals are advised to eat no more than the recommended meal amount. (NOTE: For this advisory, one fish meal is 8 ounces of uncooked fish for a 150-pound adult and 3 ounces for a 40-pound child.)

### Advisory Group: Sensitive Populations

#### Key Contaminant: Mercury

Because of the potential risk mercury poses to the developing nervous system of fetuses and young children, DHSS continues to advise high-risk, sensitive populations, to limit fish consumption. The statewide mercury advisory for all water bodies in Missouri is as follows:

**Sensitive populations** are advised to eat no more than:



**One meal per month:** walleye, largemouth bass, spotted bass, and smallmouth bass greater than 12 inches in length.



**One meal per month:** flathead, channel, and blue catfish greater than 30 inches in length.



**One meal per week:** all other sport fish, because all fish have various levels of mercury.

For **sensitive populations**, the following specific water bodies have limited-consumption advisories due to mercury:



Clearwater Lake (Reynolds County)--

- **One meal per month:** white bass greater than 15 inches in length.
- **One meal per month:** crappie greater than 9 inches in length.

### Advisory Group: All Consumers

#### Key Contaminants: PCBs, Chlordane, and Mercury

While statewide fish-tissue contaminant concentrations have declined, PCBs and chlordane are still a concern in certain water bodies. DHSS recommends that all consumers limit consumption of specified fish at the following locations for the reasons stated:



Missouri and Mississippi Rivers--



- **One meal per month:** shovelnose sturgeon fish tissue (excluding eggs) due to PCBs and chlordane; buffalo fish tissue due to PCBs and mercury
- **Do not eat:** sturgeon eggs due to PCBs and chlordane.
- **One meal per week:** flathead, channel, and blue catfish greater than 17 inches due to PCBs, chlordane, and mercury. Note: The catfish advisory for sensitive population still applies, which is one meal per month for catfish greater than 30 inches.
- **One meal per week:** common carp greater than 21 inches due to PCBs, chlordane, and mercury.



Blue River (from Minor Park to the Missouri River in Jackson County extending up Indian Creek to Holmes Road)--

- **One meal per month:** common carp and catfish for all sizes due to chlordane and PCBs.



Simpson Park Lake (at Simpson Park in St. Louis County)--

- **One meal per month:** buffalo greater than 16 inches due to chlordane, mercury, and PCBs.



Lake Buteo (at Knob Noster State Park in Johnson County)--

- **Do not eat:** largemouth and smallmouth bass due to mercury.
- **One meal per month:** all other fish for all sizes due to mercury.



Montrose Lake in Henry County

- **One meal per week:** flathead catfish longer than 24 inches due to PCBs.



Lake Springfield in Greene County

- **One meal per month:** catfish and carp of all sizes due to PCBs.

## Advisory Group: All Consumers

### Key Contaminant: Lead

DHSS recommends that all consumers limit consumption of specified fish at the following locations for the reasons stated:



Big River (St. Francois and Jefferson Counties) and Flat River (St. Francois County from Highway B to six miles downstream where it enters Big River)--

- **Do not eat:** carp, sunfish, redhorse, or other suckers due to lead.
  - Only five sunfish species are included in this advisory: longear sunfish, green sunfish, bluegill, warmouth, and rock bass.



Big Creek (Iron County near the town of Glover extending from the town of Hogan to the town of Chloride)--

- **Do not eat:** sunfish due to lead.
  - Only five sunfish species are included in this advisory: longear sunfish, green sunfish, bluegill, warmouth, and rock bass.



Adair Creek, Sweetwater Creek, and Logan Creek from Adair Creek to Susie Creek (Reynolds County) --

- **Do not eat:** Suckers and other bottom feeding species due to lead.

## **COMMERCIALLY PURCHASED FISH**

### **U.S. Environmental Protection Agency (EPA) and Food and Drug Administration (FDA) Advice for Sensitive Populations**

EPA and FDA issued updated advice on fish consumption in January 2017. In this advice, the two agencies have concluded that the following types of people should eat more fish that is lower in mercury in order to gain important developmental and health benefits:

- Pregnant and breastfeeding women
- Those who might become pregnant
- Young children

This advice was prompted in part by an analysis, conducted by the FDA, of seafood consumption data from over 1,000 pregnant women in the U.S. This study found that 21 percent of the women ate no fish in the previous month, and those who ate fish ate far less than what is recommended in the 2010 Dietary Guidelines for Americans.

The 2017 advice recommends that pregnant women eat at least 8 ounces and up to 12 ounces (2-3 servings) per week of a variety of fish that are lower in mercury to support fetal growth and development.

The updated draft advice cautions pregnant or breastfeeding women to avoid seven types of fish that are associated with high mercury levels: tilefish from the Gulf of Mexico, marlin, orange roughy, shark, swordfish, bigeye tuna, and king mackerel.

In addition, the updated draft advice recommends limiting consumption of white (albacore) tuna to 4 ounces a week.

Fish consumption choices lower in mercury include some of the most commonly eaten fish, such as: shrimp, pollock, salmon, canned light tuna, tilapia, catfish, and cod.

More information is available online at:

<https://www.epa.gov/fish-tech/epa-fda-advisory-mercury-fish-and-shellfish>.

**DHSS recommends that all consumers be aware of the positive benefits of eating fish, as well as the potential health risks from contaminants.**

## WEB RESOURCES

- Visit our website at [www.health.mo.gov/fishadvisory](http://www.health.mo.gov/fishadvisory) for more information on fish advisories, or call us at 573-751-6102 or (toll-free) 866-628-9891.
- To help you identify fish species, see the Missouri Department of Conservation's website at: <https://huntfish.mdc.mo.gov/fishing/regulations>.
- Missouri Department of Natural Resources Water Protection Program: [www.dnr.mo.gov/env/wpp/index.html](http://www.dnr.mo.gov/env/wpp/index.html).
- Missouri Stream Team: [www.mostreamteam.org](http://www.mostreamteam.org).
- The Florida Department of Health has developed a pocket card that contains commercial fish advisories: <http://www.floridahealth.gov/prevention-safety-and-wellness/healthy-weight/nutrition/seafood-consumption/index.html>.
- Healthier fish recipes can be found at: [www.heart.org/HEARTORG](http://www.heart.org/HEARTORG), select Healthy Living, Eat Smart, View Recipes.
- Missouri Department of Health and Senior Services Nutrition Program: [www.health.mo.gov/living/wellness/nutrition/](http://www.health.mo.gov/living/wellness/nutrition/).

## **APPENDICES**

Appendix A: Trimming and Cooking  
Your Fish to Reduce Fat and Chemical Contaminants

Appendix B: Contaminants of Concern

Appendix C: Future Chemical Considerations

Appendix D: Special Advisory – Lead Sinkers

Appendix E: Special Advisory - Canning, Pickling, and Grinding

Appendix F: Chemical Concentrations Used to Establish Fish Advisories in Missouri





## Appendix A

### Trimming and Cooking Your Fish to Reduce Fat and Chemical Contaminants

## TRIMMING AND COOKING YOUR FISH TO REDUCE FAT AND CHEMICAL CONTAMINANTS



Fillet your fish. Filleting is strongly recommended because removing bones, fatty tissues, and all internal organs will greatly reduce the levels of most contaminants in fish.



Trim away fatty portions of the fish such as the dorsal, lateral and belly area. (See diagram below.)



Remove the skin from fish.



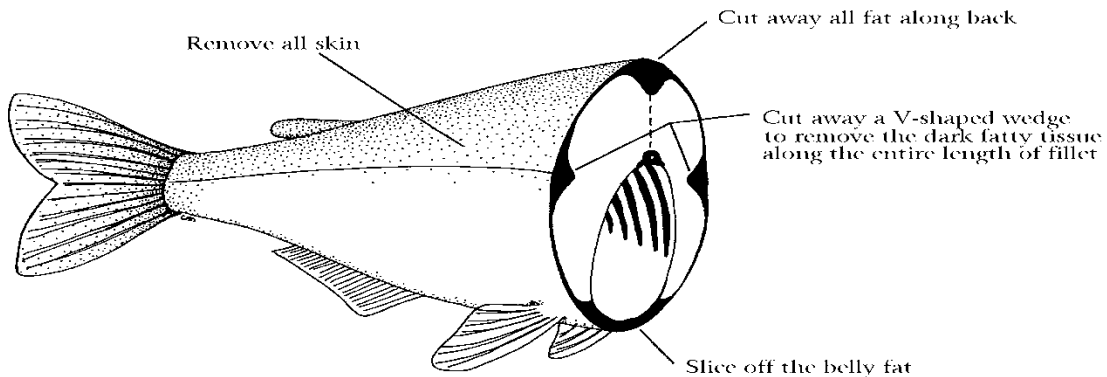
Do not eat fish eggs. They are very high in fat and may contain contaminants that are associated with fatty tissue.



Bake, grill, or broil fish on a rack and let the fat drip away. Do not use the juices. Avoid pan-frying in butter or animal fat, or making soups or chowders. These methods retain fat-laden juices. If you deep-fry fish, do not reuse the oil. Some contaminants will become concentrated in reused oil.



Since metals do not tend to concentrate in fatty tissue, filleting, trimming fat, or special cooking methods will not reduce the mercury levels.





## Appendix B

### Contaminants of Concern

## CONTAMINANTS OF CONCERN

Many adverse health effects of chemicals are discussed below; however, this does not mean that eating fish will cause these health effects. In most cases, the benefits of eating fish outweigh the risks.

### Mercury/Methylmercury

Methylmercury's potential to bioaccumulate in fish makes it the form of mercury that poses the greatest risk to humans through fish consumption. Mercury occurs naturally in the environment and can enter the environment from natural sources through the breakdown of rocks and soil and from volcanic activity. Human activities such as mining and burning of fossil fuels may account for one-third to two-thirds of the mercury released in the environment.

Nearly all fish contain trace amounts of mercury. However, this does not mean that eating fish will cause adverse health effects from mercury. In fact, for most individuals, the amount of mercury taken into the body from eating most fish is not a health concern. Smaller and/or younger fish tend to have lower levels of mercury in their bodies because they consume smaller prey and have not lived as long to have time to accumulate as much mercury in their bodies.

Methylmercury is extremely toxic to humans. Ingesting methylmercury can impair neurological development. Unborn and young children, who are in the early stages of neurological development, are at greater risk of adverse health effects. Expectant and nursing mothers can also pass methylmercury to their children. Exposure to elevated methylmercury concentrations may result in developmental delays and intelligence quotient (IQ) deficits in children.

For more information, see: the Agency for Toxic Substances and Disease Registry's (ATSDR) [ToxFAQs for Mercury](#) and ATSDR's [Don't Mess With Mercury](#) site.

### Chlordane and Polychlorinated Biphenyls (PCBs)

Chlordane's and polychlorinated biphenyls' (PCBs) potential to bioaccumulate in fish makes fish consumption a risk in certain water bodies in Missouri. PCB manufacturing stopped in 1977, and chlordane was banned in 1988. However, because PCBs and chlordane do not breakdown easily in the environment and were widely used, they can still be found throughout the United States.

While in decline in Missouri, chlordane and PCBs continue to persist in the environment. The meal advice presented in the summary table is for all fish consumers.

### Health Effects of Chlordane

Chlordane typically affects the nervous system, the digestive system and the liver. Exposure to it may cause headaches, irritation, confusion, weakness, vision problems, upset stomach, vomiting, stomach cramps, diarrhea, and jaundice. Chlordane accumulates in fatty tissue. Since breast milk is high in fat, women with levels of chlordane in their system may pass chlordane to their children through breast milk.

For more information, see: ATSDR's [ToxFAQs for Chlordane](#).



## Health Effects of Polychlorinated Biphenyls (PCBs)

PCBs may cause chloracne, other skin changes and decreased birth weights. PCBs may also affect the immune system and nervous system. PCBs may cause mild neurodevelopment delays in some children.

PCBs accumulate in fatty tissue. Since breast milk is high in fat, women with PCB in their system may pass it to their children through breast milk.

For more information, see: ATSDR's [ToxFAQs for PCBs](#).

## Lead

Lead's potential to accumulate in fish makes fish consumption a risk in certain regions of Missouri, especially in mining areas. If fish in an area have elevated levels of lead, it would be a safe assumption that invertebrates (such as: crayfish, mussels, etc.) also have elevated levels of lead.

The meal advice in this advisory only considers an individual's exposure to lead from eating fish. It does not consider other possible sources of lead, listed below.

Lead is a naturally occurring metal found in the earth's crust. For most of its history, Missouri has been the top lead producer in the country. Deposits of lead ore have been discovered and mined in many of Missouri's counties south of the Missouri River. In counties like Jasper, Madison, Jefferson, St. Francois, Washington, and Iron where lead mining occurred, yard soil and private drinking water may contain much higher lead levels than in other parts of Missouri.

Lead has no nutritional benefits for humans. Children are more susceptible to lead poisoning than adults. Lead has the greatest effect on the nervous system in adults and especially in children. Women can experience complications with their pregnancy if they are exposed to high lead levels. These complications range from low birth weight to miscarriage. Nursing mothers with lead in their blood may pass it to their children through breast milk.

Lead is most dangerous to unborn and young children. When lead enters the body, a larger proportion of the lead is absorbed and retained by children compared to an adult. Adverse health effects of lead in children may include decreased IQ scores, learning disabilities, slowed growth, hyperactivity, impaired hearing, and, at very high exposure levels, brain damage. In children and adults, lead can cause weakness in fingers, wrists, or ankles. Unborn children can also be exposed to lead through their mothers. Lead can cause premature births, low birth weight, decreased mental ability, learning difficulties, and reduced growth in young children. **Yearly blood-lead testing before a child is 72 months (6 years) old is key to determining if a child has been exposed to lead.**

For more information, see: ATSDR's [ToxFAQs for Lead](#).





## Appendix C

### Future Chemical Considerations

## FUTURE CHEMICAL CONSIDERATIONS

Scientific advancements have led to the detection of certain chemicals in water bodies at much lower concentrations than previously possible. In addition, new and emerging technology and products may have unforeseen environmental or health issues. Those being studied to determine their environmental and human health effects include polybrominated diphenyl ethers (PBDEs), endocrine disruptors, pharmaceuticals and personal care products (PPCPs), and nanoscale materials. **At present, none of these “emerging contaminants,” as they are sometimes called, has prompted a fish consumption advisory in Missouri.** DHSS will continue to monitor advancements in science pertaining to emerging contaminants. Each of these will be discussed briefly below.

### Polybrominated Diphenyl Ethers (PBDEs)

PBDEs are man-made, flame-retardant chemicals. They are added to a variety of consumer products, such as plastic and foam, to reduce a product’s ability to burn. Because PBDEs are so widespread in the environment, they may also be found in fish tissue. Today most people have been exposed to low levels of PBDEs in their everyday environment. However, there is little information on the health effects of PBDEs on humans.

For more information, see: ATSDR’s [ToxFAQs for Polybrominated Diphenyl Ethers \(PBDEs\)](#).

### Endocrine Disruptors

Endocrine disruptors are chemicals that may affect the endocrine system. These chemicals can mimic the body’s natural hormones, blocking a hormone’s effects, or directly stimulating or inhibiting the endocrine system. Evidence strongly suggests that exposure to endocrine disruptors can affect the development and reproduction of fish and wildlife in certain locations. But how low levels of these chemicals affect humans is not well understood.

For more information see: EPA’s [Endocrine Disruptor Screening Program \(EDSP\)](#).

### Pharmaceuticals and Personal Care Products (PPCPs)

PPCPs are a very broad classification of thousands of chemical substances that include products used for personal health or cosmetic reasons or to increase the growth or health of livestock. PPCPs include prescription and over-the-counter medication, veterinary drugs, cosmetics, sunscreen, and vitamins. Studies have found PPCPs in most of the U.S. water bodies that have been sampled. Research suggests that some ecological harm may occur when certain PPCPs are present; however, no health effects on humans have been identified yet.

For more information on how to dispose of prescription drugs, see: [The White House Office of National Drug Control Policy Guidance for the Proper Disposal of Prescription Drugs](#).

## **Nanoscale Materials**

Nanotechnology makes it possible to create microscopic materials roughly 100 to 10,000 times smaller than the thickness of human hair. These nanoscale materials may have different properties than the same chemical substances at larger sizes. For instance, a nanoscale material may be lighter, stronger, or more reactive than the original substance. Nanotechnology has the potential to provide many benefits, yet it may also pose a hazard to humans and the environment. Nanotechnology is in its early stages of development. Few detailed studies are available on how nanomaterials affect humans or the environment.

For more information on nanotechnology and nanoscale materials, see: EPA's [Fact Sheet for Control of Nanoscale Materials under the Toxic Substances Control Act](#).



## Appendix D

### Special Advisory – Lead Sinkers

## **Advisory: Lead in Fishing Tackle**

**DHSS recognizes that lead can be harmful to individuals, especially children, when ingested or inhaled. Therefore, DHSS recommends using fishing tackle made of alternative materials such as tin, bismuth, tungsten, and ceramic.**

Many of us do not have to look further than our tackle boxes to find lead. Items like sinkers, weights, shots, jig heads, and weighted hooks are often made of lead. Improper use and handling of these items may result in lead entering your body. Adults, and especially children, are susceptible to adverse health effects from lead. Protect yourself and your family by following these simple steps:

1. Replace the lead items in your tackle box with non-lead alternatives such as tin, bismuth, tungsten, and ceramic. These alternatives are sold at most locations fishing tackle is sold.
2. If non-lead fishing tackle is not a viable option, you can still minimize your exposure by:
  - a) Never putting lead weights in your mouth! AND
  - b) Washing your hands before eating, drinking or putting them in or near your mouth.

Following these simple steps will help protect you and your family from the dangers of lead.

**Special Advisory:** MELTING LEAD IS VERY DANGEROUS! Melting lead to cast sinkers should not be done at home. Lead fumes and lead dust can be released during this process and contaminate your home, garage, yard, and clothes.





## Appendix E

### Special Advisory - Canning, Pickling, and Grinding

### **Advisory: Canning, Pickling, and Grinding May Increase the Amount of Lead Ingested**

Lead accumulates in fish bone at much higher concentrations than in other parts of fish. Because fish bones are not typically consumed by individuals, the amount of lead in the bone is usually not taken into account while drawing recommendations for the Missouri Fish Consumption Advisory. However, suckers and carp have small, needle-like bones in their fillet that are difficult to remove. Some people may prepare and consume these fish without removing these bones. But consuming these bones may increase the health risks associated with lead.

Suckers, carp, and sunfish may have high bone-lead levels if they are caught in counties where lead mining has historically occurred, like Jasper, Madison, Jefferson, St. Francois, Washington, and Iron. For these fish, caught in these historic mining areas, it is recommended that individuals avoid preparation methods that make a large portion of their bones easy to consume. Such methods may include canning, pickling, and grinding.



## Appendix F

### Chemical Concentrations Used to Establish Fish Advisories in Missouri

## Fish Fillet Advisory Concentrations (FFAC)

To calculate the Fish Fillet Advisory Concentration (FFAC), both cancer and non-cancer health effects are evaluated for the chemicals. Calculations are made using standard assumptions from EPA for adults and children, such as: body weight and amount of fish eaten per meal. From these calculations, the most appropriate value is chosen as the FFAC.

For non-cancer health effects, appropriate Reference Doses (RfDs) were used that estimate the daily lifetime dose of a substance that is unlikely to cause harm in humans. For a chemical found to have carcinogenic effects, the chemical's slope factor (CSF) was used that represents an upper bound estimate of the probability that exposure to the chemical will result in an increased cancer risk over a lifetime.

An RfD for lead has not been developed. Therefore, the usual approach of estimating human exposure to an environmental contaminant and then comparing this dose to a health guideline cannot be used. Instead, human exposure to lead is evaluated by using a biological model, the Integrated Exposure Uptake Biokinetic Model (IEUBK), which predicts a blood lead concentration that would result from exposure to environmental lead contamination.

DHSS has concluded that the significant health benefits associated with eating fish needs to be taken into account when developing fish advisory recommendations. Due to the many health benefits associated with eating fish, DHSS added a Benefit Value (BV) to the FFAC calculations. These BVs have allowed the benefits of eating fish to be taken into consideration, while still protecting human health.

### Fish Advisory Contaminant Levels (mg/kg)

	1 meal/week	1 meal/month	Do Not Consume
Mercury	0.156*	0.270*	1.000
PCBs	0.045	0.135	0.540
Chlordane	0.026	0.052	0.210
Lead	NA	NA	0.300

\* - Mercury values for one meal/week and one meal/month are targeted for sensitive populations only.

mg/kg – milligrams per kilogram

NA – Not Applicable, Not Calculated